

CLAIMS

1. A photothermal actuator comprising:

an optical fiber bundle that is inserted in a tube;

a light inputting apparatus that inputs light into said

5 optical fiber bundle; and

a thermal receiving element that is provided on a part

of an outer surface of said optical fiber bundle,

said thermal receiving element being heated by said light

so that said thermal receiving element and a part of said optical

10 fiber bundle are stretched, whereby said optical fiber bundle

and said tube are bent.

2. An actuator according to claim 1, wherein said thermal

receiving element covers half the circumference of said outer

surface.

15 3. An actuator according to claim 1, wherein said thermal

receiving element is provided on an end portion of said optical

fiber bundle.

4. An actuator according to claim 3, wherein said end portion

is cut at an incline to the axis of said optical fiber bundle.

20 5. An actuator according to claim 1, wherein said thermal

receiving portion is formed from at least one of a metal layer

and a resin layer.

6. An actuator according to claim 1, wherein said optical

fiber bundle is adjacent to an outer surface of said tube,

25 and said thermal receiving portion faces the inside of said

tube.

7. An actuator according to claim 1, wherein said thermal receiving element covers a wedge shaped area of an end portion of said optical fiber bundle.

5 8. A guide wire having a photothermal actuator, said photothermal actuator comprising:

an optical fiber bundle that is inserted in a tube;  
a light inputting apparatus that inputs light into said optical fiber bundle; and

10 a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,  
said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical fiber bundle are stretched, whereby said optical fiber bundle  
15 and said tube are bent.

9. A guide wire having a tube and some photothermal actuators, each photothermal actuator comprising:

an optical fiber bundle in which light is inputted by a light inputting apparatus, said optical fiber bundle being  
20 inserted in said tube; and

a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,  
said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical  
25 fiber bundle are stretched, whereby said optical fiber bundle

and said tube are bent.

10. A guide wire according to claim 9, wherein said optical fiber bundles are arranged in a concentric circle in said tube at even intervals.

5 11. A guide wire according to claim 9, wherein said optical fiber bundles are formed into a group of optical fiber bundles, said optical fibers bundles in said group adjoining each other.

12. A guide wire according to claim 11, wherein said guide wire comprises a plurality of said groups, and said groups  
10 are arranged in a concentric circle in said tube at even intervals.

13 A catheter having a photothermal actuator, said photothermal actuator comprising:

an optical fiber bundle that is inserted in a tube;

15 a light inputting apparatus that inputs light into said optical fiber bundle; and

a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,

20 said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical fiber bundle are stretched, whereby said optical fiber bundle and said tube are bent.

14. A catheter having a tube and some photothermal actuators, each photothermal actuator comprising:

25 an optical fiber bundle in which light is inputted by

a light inputting apparatus, said optical fiber bundle being inserted in said tube; and

a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,

5 said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical fiber bundle are stretched, whereby said optical fiber bundle and said tube are bent.

15. A catheter according to claim 14, wherein said optical

10 fiber bundles are arranged in a concentric circle in said tube at even intervals.

16. A catheter according to claim 14, wherein said optical fiber bundles are formed into a group of optical fiber bundles, said optical fibers bundles in said group adjoining each other.

15 17. A catheter according to claim 16, wherein said guide wire comprises a plurality of said groups, and said groups are arranged in a concentric circle in said tube at even intervals.

18. An endoscope having a photothermal actuator, said  
20 photothermal actuator comprising:

an optical fiber bundle that is inserted in a tube;  
a light inputting apparatus that inputs light into said optical fiber bundle; and

25 a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,

said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical fiber bundle are stretched, whereby said optical fiber bundle and said tube are bent.

- 5 19. An endoscope having a tube and some photothermal actuators, each photothermal actuator comprising:

an optical fiber bundle in which light is inputted by a light inputting apparatus, said optical fiber bundle being inserted in said tube; and

- 10 a thermal receiving element that is provided on a part of an outer surface of said optical fiber bundle,

said thermal receiving element being heated by said light so that said thermal receiving element and a part of said optical fiber bundle are stretched, whereby said optical fiber bundle and said tube are bent.

- 15 20. An endoscope according to claim 19, wherein said optical fiber bundles are arranged in a concentric circle in said tube at even intervals.

21. An endoscope according to claim 19, wherein said optical fiber bundles are formed into a group of optical fiber bundles, said optical fibers bundles in said group adjoining each other.

22. An endoscope according to claim 21, wherein said endoscope comprises a plurality of said groups, and said groups are arranged in a concentric circle in said tube at even intervals.